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treme contagiousness of diphtheria from person to person is well known, and the virus adheres tenaciously to objects on which it happens to alight. The clothing of a patient, even when the disease is of the mildest form, his bedding, the furniture of his room, and the objects which he handles, may for weeks afterward communicate the disease. Dr. Sternberg, in his recent Lomb Prize essay, also mentions the fact that all damp, foul places, such as sewers, cellars, and ill-ventilated spaces under floors, afford conditions favorable for the development and propagation of the diphtheritic virus. The virus, once received, may be propagated in such a place for an indefinite time; and, ascending in the vapors which arise from this culture-bed, it is liable to communicate the disease to any one who inhales it. Thus in New York City prior to 1850, although foul sewers and unsanitary conditions existed, there was no diphtheria; but in the decade following 1850 this disease was introduced. The germ made its way into the sewers under ground; and now, wherever sewer-gas escapes into the domiciles of the city, it carries with it the diphtheritic poison. The amazing vitality and power of propagation of this virus are apparent when we reflect that it has permanently infected the New York sewers, so that children in all parts of the city are constantly falling ill with the disease.

THE BACILLUS OF TUBERCULOSIS.—According to M. Moulé, domestic fowls are frequently the subjects of tuberculosis, the disease often involving the abdominal organs. *Paté de foie gras* is sometimes almost a pure culture of tubercle bacilli. Dr. Squire of the London Epidemiological Society states that the bacillus of tuberculosis may enter the body (1) by inoculation through a cut or scratch; (2) by means of the genito-urinary mucous membrane; (3) by the product of conception, and by direct hereditary transmission; (4) by the mucous membrane of the alimentary canal; (5) by the mucous membrane of the respiratory tract, and by the air-cells of the lungs. The possibility of infection through the alimentary tract assumes importance from the prevalence of tuberculosis in animals which are used as food, and from the experimental proof of the infectiousness of the milk of tuberculous cows. The present state of knowledge on the subject points very strongly to the necessity for careful inspection of cattle kept for dairy purposes, and for precautions in using the milk, and possibly also the flesh, of diseased animals.

THE CONTAGIOUSNESS OF TUBERCULOSIS.—The New York Board of Health has passed the following resolution: Resolved, that Drs. T. M. Prudden, H. M. Biggs, and H. P. Loomis, the pathologists of this department, be and are hereby requested to formulate a brief and comprehensive statement regarding the contagiousness of tuberculosis in man, stating therein the evidence of the same, and recommending, in the briefest possible manner practicable, the simplest means of protection from its influence.

LEAD-POISONING.—At a meeting of the Practitioners' Society of New York, Dr. Kinnicutt, the president, reported two cases of lead-poisoning occurring from an unusual source. The first patient was admitted to St. Luke's Hospital, suffering from lead colic and "wrist-drop." He had been employed as a florist; and on investigation by Dr. Vaughan, the house-physician, it was found he had been in the habit of biting off the ends of the tinfoil used as wrappers for hand bouquets. The tinfoil used for this purpose contained as much as eighty per cent of lead. There was no history of other sources of lead-poisoning. The second patient was admitted to the hospital, suffering from lead colic, and presenting a typical blue gum-line. He had been in the habit, for several weeks, of drinking beer from bottles which, he said, were cleaned by his employer with lead shot. Dr. R. F. Weir recalled the fact that several cases of lead-poisoning, some years ago, had been traced to the use of a popular brand of chewing-tobacco which was wrapped in tinfoil. Dr. Dana referred to some cases of poisoning which had been traced to the consumption of certain beverages coming in bottles with so-called patent stoppers. He said that he had recently had two Chinese patients in his hospital service, both of whom were suffering from lead-poisoning. He was unable to trace the source of the poisoning.

SCIENCE.

ELECTRICAL NEWS.

AYRTON AND PERRY'S SECOHMETER AND SECOHM STANDARD.—In default of a full description, we have to content ourselves with the announcement that Professors Ayrton and Perry will shortly put a standard secohm on the market as an accessory to their secohmmeter. The advantage of such a standard is evident, since it reduces the manipulations with the secohmmeter to a very few simple ones, and dispenses with the use of a speed-counter, or tacheometer, for absolute determinations with the mentioned instrument. This standard secohm will be used much in the same way as any standard resistance would be used in the Wheatstone bridge; in fact, the secohmmeter is nothing more than a very nicely constructed double commutator. Descriptions of the secohmmeter proper appeared in several of the electrical papers some time since. Nothing, however, was said about the use of this instrument. Through James W. Queen & Co., the sole agents for the Ayrton and Perry instruments, we have received a full description explanatory of the mode of using the secohmmeter for determining absolutely, or comparing, the co-efficients of self-induction. This description will be found on another page.

TOPEKA ELECTRIC RAILWAY.—The Topeka Rapid Transit Railway, the equipment of which has just been finished by the Thomson-Houston Electric Company, was put in operation on April 3. This road is said to be the longest in the world (14 miles, 20 miles of track). The trial trip was made on Wednesday, April 3, with four cars filled with invited guests, including the managers and chief officials of the Topeka City Street Railway and the East and West Side Circle Railways, and was satisfactory. The electrical apparatus consists of six 30-horse-power Thomson-Houston generators. The residents of Topeka are enthusiastic, and it is predicted that ere long electricity will be in general use on all the street-railways in the city.

EARTHING LIGHTNING-CONDUCTORS BY MEANS OF GAS AND WATER PIPES.—In the *Elektrotechnische Zeitschrift* (vol. xx. p. 473), A. Voller has an article on the above subject, an abstract of which appears in the *Journal of the Institution of Electrical Engineers*, No. 77. It is generally assumed that the path of the discharge follows only the line of least resistance, and no attention has been paid to the fact, on which Mr. Voller insists, that the direction of the discharge is chiefly influenced by the state of electric potential of the buildings in closest proximity to the charged cloud. The better the connection of the metallic masses in buildings is with the earth, the higher will be the potential of the induced electricity, and the greater likelihood is there of a discharge taking place between the cloud and the points in question. Since the general introduction of gas and water pipes into our houses, it is these which offer the least resistance between the roofs and earth. Hence, if a charged cloud should pass over such a house, the gas and water pipes must be at a higher potential, and there is much greater probability of the lightning entering the house through them than at any other point: in other words, it is more likely that the discharge will take place through the pipes than through the lightning-conductor; and, if the lightning-rod is not connected to the pipes, the discharge will find its way somehow to the latter, causing destruction in its path. At the request of the Hamburg fire insurance companies, Mr. Voller undertook to inspect cases of lightning-strokes, and to ascertain the point struck, as well as the path followed. A great many interesting cases investigated are duly recorded, but some general results only can be reproduced. It generally happened, that, when the building struck was unprovided with a lightning-conductor, the lightning struck some part of the roof or walls, found its way to the gas and water pipes, and then passed harmlessly to earth. In the few cases where lightning struck a building fitted with a lightning-conductor, the discharge jumped over from the conductor to the pipes. In fifteen cases which were specially investigated in the years 1884 and 1888, after the lightning had done more or less damage at the point where it struck, and in the immediate neighborhood, it was found that in nine cases the discharge made its way to earth through the water-pipes, in two cases through the gas-pipes, in two cases through rain-pipes, in one case probably through the lightning-conductor of

a telephone line on the next house, and in one case through an iron crane. In all cases where the pipes were the conductors, the path of the discharge could be clearly traced up to them, and then ceased. One of the cases of discharge through the gas-pipes occurred in an ordinary dwelling-house provided with a lightning-conductor, from which the discharge had passed over a distance of about two metres to the pipes. Subsequent tests showed that the conductor-earth had a resistance of 138 ohms. In no case was any damage done to the pipes by the discharge occurring through them.

NOTES AND NEWS.

THE following is a complete list of the papers presented and read to the National Academy of Science, at its meeting in April: "On Composite Coronagraphy," by D. P. Todd; "Additional Experimental Proof that the Relative Co-efficient of Expansion between Baily's Metal and Steel is Constant between the Limits Zero and 95° F." (read by title), by W. A. Rogers; "Notice on the Method and Results of a Systematic Study of the Action of Definitely Related Chemical Compounds upon Animals," by Wolcott Gibbs and Hobart Hare; "On Sensations of Color" and "Determinations of Gravity," by C. S. Peirce; "On the Pliocene Vertebrate Fauna of Western North America" and "On the North American *Proboscidea*," by E. D. Cope; "On the Mass of Saturn," by A. Hall, jun.; "On the Nature and Composition of Double Halides" (read by title), "On the Rate of Reduction of Nitro-Compounds," and "On Some Connection between Taste and Chemical Composition," by Ira Remsen; "Recent Researches in Atmospheric Electricity," by T. C. Mendenhall; "Measurement by Light-Waves," by A. A. Michelson; "On the Feasibility of the Establishment of a Light-Wave as the Ultimate Standard of Length," by A. A. Michelson and E. W. Morley; "On the General Laws pertaining to Stellar Variation," by S. C. Chandler; "Review of the Trivial Names in Piazzi's Star Catalogue," by C. H. F. Peters; "On Cretaceous Flora of North America," by J. S. Newberry; "Terrestrial Magnetism" (read by title), Cleveland Abbe; "Spectrum Photography in the Ultra-Violet," by Romyn Hitchcock; "North American *Pelagidae*" (read by title) and "Development of Crustacea" (read by title), by W. K. Brooks; "The Plane of Demarcation between the Cambrian and Precambrian Rocks," by C. D. Walcott; "Report of the American Eclipse Expedition to Japan, 1887," by D. P. Todd.

— While it will be a long time before compound locomotives will be in extensive use in the United States, the time is not far distant when, in the opinion of the *Railroad Gazette*, they will receive considerable attention and extended trials on our railroads. The demand for decreased operating expenses is becoming too strong, particularly the demand made for a more economical use of fuel, to permit the discouragement of any promising innovation which indicates the possibility of a reduction of fuel-consumption. The saving which is claimed for the double-expansion locomotives in Europe, fifteen or twenty per cent, is sufficient, when applied to the coal-bills of some of our Western roads, to pay a dividend of one per cent; and it is not likely that such a promised saving, offered with so little radical change as that resulting from the introduction of double-expansion engines, will be allowed to pass without notice. It would be well to remember that there is no inherent evil in the compound locomotive which would render it objectionable in American railroad-service. Any representation that it cannot start heavy trains or propel them up steep grades is wholly without foundation. Some of the most powerful locomotives on the face of the earth are compound engines, working on the heavy grades in the mountains of the Eastern Continent.

— Entrance examinations for the Massachusetts Institute of Technology will be held in Boston on May 30 and 31. A second series, for those unable to be present in May, will be held on Sept. 24 and 25. For the convenience of applicants outside New England, entrance examinations will be held on May 30 and 31 in the following cities: New York, at the Fifth Avenue Hotel; Philadelphia, at the Lafayette Hotel; Montreal, at the Windsor Hotel; Chicago, Board of Education rooms, City Hall; St. Louis, office of

the superintendent of public schools; Cincinnati, office of the superintendent of public schools; San Francisco, 211 Drumm Street; Washington, United States Geological Survey; St. Paul, High School Building; Pittsburg, at the rooms of the Engineers' Society of Western Pennsylvania; Kansas City, at the office of the Board of Education. Candidates for admission will be allowed, at their option, to divide their entrance examinations between two successive years. The first divided examination will be held only in June; the second, in either June or September of the following year. To be admitted to the first divided examination, the candidate must be at least sixteen years of age, and must have notified the secretary of the faculty, at least two weeks before the date fixed for the examination, of his intention to apply. This notification must be accompanied by a list of the six subjects in which he will submit himself, and by a certificate from his teacher stating that he is qualified in them.

— The Zoölogical Museum at Leyden, one of the most considerable on the Continent, we learn from *Nature*, has narrowly escaped a terrible disaster. On Monday, the 1st of this month, a fire broke out, and all the resources of the officials and of the town were taxed to extinguish it. Indeed, it was not got under until a considerable portion of the collection of specimens of hollow-horned ruminants had been destroyed. Had the accident, which arose from the defect of a flue, taken place at night instead of in the afternoon, when plenty of assistance was promptly at hand, it is believed that the whole museum would have perished. The authorities of other museums, especially those which contain many spirit preparations, should not neglect this warning.

— We have already mentioned that an international meeting of zoölogists will be held in Paris in August. The president, according to *Nature*, will be M. Milne-Edwards, and some important questions will be submitted for consideration. Among them will be the question of the unification of the language of zoölogy in classification and specific denotation. M. R. Blanchard has prepared an important report on the subject, which will be published shortly in the *Revue Scientifique*, and form the basis for the discussions at the congress.

— The Physiological Congress which is to be held in Basle in September will be attended, says *Nature*, by many French physiologists, if all those who propose to go are able to carry out their intention.

— The Eiffel Tower continues to be the hero, so to speak, of various adventures. According to *Le Génie Civil*, which is its official biographer, a story was circulated not long ago in Paris to the effect that it had begun to lean. The outline of the structure makes it very difficult to see whether it is vertical or not; and the rumor spread rapidly, until it came to be asserted that the tower would soon resemble the Leaning Tower of Pisa, to which it was constantly compared. There was no reason whatever to suppose that any movement had taken place; but the public solicitude became serious enough to make it advisable to have the matter tested, and two engineers were sent with theodolites to make a careful survey. As there are no vertical arrises in the tower, the method of observation employed was to trace the intersection of two vertical planes meeting at right angles in the centre of the tower, and bisecting each face. This was done, and the two theoretical planes were found to divide the faces of the tower with almost perfect symmetry, showing that the shaft was not inclined in any way from the vertical. On three of the sides the curvature was found to be exactly as designed, while the fourth side showed a hollow amounting to about an inch of deviation from the intended line. In another affair the tower is the aggressor, instead of being the victim of outside malice. It seems, says the *American Architect*, which is no friend of this structure, that the structure claims to be a work of art, like a picture or a statue, and to be therefore entitled to the benefit of the statutes for the protection of artistic property. Whatever rights of this kind may attach to it have been assigned to a M. Jaluzot, who has undertaken to defend his acquisition by claiming that all persons who sell photographs, models, pictures, or representations of any kind, of the tower, must pay him a royalty on such sales of twenty per cent on the price. As pictures and